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Original Article

Patterns and predictors of Quality-of-Life impairment in alopecia areata: A cross-sectional analysis from south India

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ABSTRACT

Background: Alopecia areata (AA) is a chronic immune-mediated hair loss disorder with an unpredictable course and variable clinical severity. Beyond physical hair loss, AA can result in significant psychosocial distress, influenced by disease extent, visibility, chronicity, and associated comorbidities. However, region-specific data from South India remain limited, where sociocultural perceptions of appearance may modify quality-of-life (QoL) outcomes. **Objectives:** To assess QoL impairment using the Dermatology Life Quality Index (DLQI) in South Indian patients with AA and to identify demographic and clinical predictors of QoL burden. **Materials and Methods:** This hospital-based cross-sectional study included 63 adults aged 18–45 years with clinically diagnosed AA. Demographic details, clinical characteristics, disease severity assessed using the Severity of Alopecia Tool (SALT), pattern and site of involvement, nail changes, and associated comorbidities were documented. Quality of life was evaluated using the Dermatology Life Quality Index (DLQI). Associations between clinical variables and QoL impairment were analyzed using appropriate statistical tests, including *t*-tests, one-way ANOVA, and Chi-square tests. **Results:** The mean DLQI score was 2.86 ± 4.08, indicating overall mild QoL impairment; however, 19% of patients experienced moderate-to-large impact. Younger females (<30 years) demonstrated longer disease duration and higher DLQI scores compared with males. Patients with autoimmune or atopic comorbidities had significantly greater QoL impairment ($p = 0.036$). Extensive disease (SALT > 50) was associated with markedly higher DLQI scores compared to limited disease (6.10 vs. 2.02; $p = 0.002$). Upper-face involvement resulted in the greatest QoL burden, while body hair involvement was also significantly associated with increased impairment ($p = 0.017$). **Conclusion:** Quality-of-life impairment in AA arises from a complex interaction between disease severity, visibility of hair loss, chronicity, demographic factors, and comorbid conditions. Routine assessment of psychosocial impact alongside clinical evaluation is essential to deliver comprehensive, patient-centered management for individuals with alopecia areata.

Key words: Alopecia Areata, Quality of Life, Dermatology Life Quality Index, Autoimmune Diseases, Comorbidity, South Asia, Cross-Sectional Studies, Disease Severity

INTRODUCTION

Alopecia areata (AA) is a frequently encountered immune-mediated form of non-scarring hair loss, notable for its abrupt onset and variable, often unpredictable clinical progression. Clinically, AA may manifest as localized patchy hair loss or advance to more widespread involvement of the scalp, face, and other body sites. Despite being medically benign, the visible presentation and relapsing course of AA frequently lead to considerable psychological and social consequences for affected individuals [1].

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The etiopathogenesis of AA is attributed to autoimmune-mediated damage to anagen hair follicles in genetically susceptible individuals, with additional contributions from immune dysregulation and environmental triggers [2,3]. AA is commonly associated with other autoimmune and atopic conditions, including thyroid disorders, vitiligo, and atopic dermatitis, which may further increase disease burden and chronicity [4]. The wide clinical spectrum of AA, extending from limited involvement to alopecia totalis or universalis, contributes to considerable variability in patient perception and disease-related impact [5].

Hair is closely linked to self-identity and social perception, particularly during young adulthood. Accordingly, hair loss associated with AA may result in emotional disturbances such as anxiety, depressive symptoms, reduced self-esteem, social withdrawal, and impaired interpersonal relationships [6,7]. Importantly, the psychosocial impact of AA does not consistently correspond to the objective extent of hair loss, suggesting that additional factors may independently influence quality-of-life outcomes [8].

The clinical severity of AA is typically assessed using objective instruments such as the Severity of Alopecia Tool (SALT), which quantifies the extent of scalp involvement [9]. Although SALT offers a standardized assessment of disease severity, it does not adequately capture the subjective emotional and functional burden experienced by patients. Patient-reported outcome measures, including the Dermatology Life Quality Index (DLQI), are therefore essential for evaluating the broader psychosocial impact of AA [10].

Although multiple studies have examined quality-of-life impairment in AA, reported findings remain inconsistent across different populations and cultural contexts [11]. In India, region-specific data examining the relationship between disease severity, clinical patterns, and quality-of-life outcomes remain limited, particularly from South India, where sociocultural perceptions of appearance may further modulate psychosocial distress [12].

The present study was therefore conducted to evaluate quality-of-life impairment in patients with alopecia areata and to identify key clinical and demographic predictors of psychosocial impact, with emphasis on disease severity, pattern and site of involvement, duration of illness, and associated comorbidities, in a tertiary care setting in South India.

MATERIAL AND METHODS

This hospital-based observational cross-sectional study was conducted in the Department of Dermatology at a medical college located in North Karnataka, in South India. The study was conducted over an 18-month period from July 2022 to December 2023. Ethical approval was obtained from the Institutional Ethics Committee (IEC approval number: KIMS/IEC/2022/07), and written informed consent was secured from all participants prior to enrollment. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

Adults aged 18–45 years presenting to the dermatology outpatient department with a clinical diagnosis of alopecia areata were consecutively enrolled. Diagnosis was established by senior dermatologists based on characteristic clinical features, including well-defined non-scarring alopecic patches, exclamation mark hairs, and peribulbar hair loss patterns. Patients were excluded if they had other primary hair disorders (such as androgenetic alopecia, telogen effluvium, or scarring alopecia), active systemic or psychiatric illnesses likely to influence quality-of-life assessment, recent initiation (within four weeks) of systemic corticosteroids or biologic agents, or if they were unwilling or unable to provide informed consent.

Sample size estimation was performed to determine the mean Dermatology Life Quality Index (DLQI) score with adequate precision. The required sample size was calculated using the standard formula for estimating a population mean:

$n = (Z_{1-\alpha/2} \times \sigma/d)^2$, where $Z_{1-\alpha/2}$ was taken as 1.96, corresponding to a 95% confidence level, σ was assumed to be 4 based on previously published DLQI data in alopecia areata, and d represented an allowable absolute error of 1. Using these parameters, the minimum sample size was calculated as 62, and a total of 63 patients were ultimately included in the study.

Demographic and clinical information was collected using a structured data recording pro forma. Information obtained included age, sex, educational level, occupation, marital status, and socioeconomic status, along with relevant clinical history such as age at disease onset, duration of illness in months, history of relapses, prior treatment modalities (including topical agents, systemic therapies, and complementary medicine), childhood onset, and family history of

alopecia areata or atopic conditions. Socioeconomic status was categorized based on hospital-specific, locally accepted criteria and classified as below or above the poverty line.

All participants underwent a comprehensive dermatological examination. The clinical pattern of alopecia areata was categorized as patchy disease, alopecia totalis, or alopecia universalis, along with documentation of the initial site and distribution of scalp involvement. (right, left, vertex, or posterior regions). Involvement of body hair was assessed and categorized as absent (B0), partial (B1), or complete loss (B2). Beard involvement was recorded where applicable, and facial hair loss affecting the eyebrows and/or eyelashes was noted and collectively referred to as "upper face" involvement. Nail findings were also evaluated and classified as absent (N0) or present (N1), with specific nail changes such as pitting, longitudinal ridging, and melanonychia documented when present.

The extent of scalp hair loss was quantified using the Severity of Alopecia Tool (SALT) score, which estimates the percentage of hair loss across predefined scalp regions and generates a cumulative score ranging from 0 to 100. For analytical purposes, patients were classified into severity categories based on established SALT thresholds: limited disease (SALT 1–20), moderate disease (SALT 21–49), severe disease (SALT 50–94), and very severe or universal involvement (SALT 95–100). To enhance statistical robustness in selected analyses, SALT scores were further grouped into two categories—limited disease (SALT ≤50) and extensive disease (SALT >50)—as described in the Results section.

Health-related quality of life was evaluated using the Dermatology Life Quality Index (DLQI), a validated 10-item questionnaire with total scores ranging from 0 to 30, where higher scores indicate greater impairment. DLQI scores were interpreted using established severity bands: 0–1 (no effect on quality of life), 2–5 (small effect), 6–10 (moderate effect), 11–20 (large effect), and 21–30 (very large effect). The questionnaire was administered in the participant's preferred language, either English or the local vernacular, by trained study personnel. In cases where participants required assistance due to literacy or comprehension difficulties, the questions were read exactly as written and responses were recorded objectively to minimize interviewer-related bias.

Information regarding associated comorbidities was collected through detailed patient interviews and review of available medical records. Particular emphasis was placed on identifying atopic conditions, including allergic rhinitis, atopic dermatitis, and asthma, as well as thyroid disorders, especially hypothyroidism, due to their known association with alopecia areata and potential influence on disease burden. A diagnosis of hypothyroidism was considered confirmed when prior documentation by a treating physician was available, supported by relevant investigations such as elevated thyroid-stimulating hormone levels or ongoing levothyroxine therapy. In cases where diagnostic certainty was unclear, patients were requested to provide previous medical records; if confirmatory evidence was unavailable, such cases were classified as having a history of suggestive symptoms rather than a definitive comorbid diagnosis.

All data were entered into a secure, password-protected database and analysed using Statistical Package for the Social Sciences (SPSS) software version 20.0 (IBM Corp., Armonk, NY, USA). Continuous variables were summarized as mean ± standard deviation or as median with interquartile range, depending on data distribution, which was evaluated using the Shapiro–Wilk normality test. Categorical variables were expressed as absolute numbers and percentages.

Group-wise comparisons of mean DLQI scores were conducted using the independent samples *t*-test for analyses involving two groups and one-way analysis of variance (ANOVA) for comparisons across three or more groups when assumptions of normality were satisfied. In instances where data did not meet normality assumptions, corresponding non-parametric tests, namely the Mann–Whitney U test or the Kruskal–Wallis test, were employed. When ANOVA results were statistically significant, post-hoc pairwise analyses were performed using the Bonferroni adjustment to account for multiple comparisons. Relationships between categorical variables were evaluated using the Chi-square test, with Fisher's exact test applied when expected cell counts were low. A two-tailed p-value of less than 0.05 was considered statistically significant. To facilitate interpretation of meaningful differences, effect sizes were calculated for key comparisons using Cohen's *d* or eta squared, as appropriate.

Prior to statistical analysis, the dataset was reviewed to ensure completeness and internal consistency. Missing values were infrequent, with no variable demonstrating

more than 5% missing data. Participants lacking data for the primary outcome measure (DLQI) were excluded from analyses involving quality-of-life outcomes. For variables with sporadic missing values, analyses were restricted to complete cases, and data imputation was not undertaken in view of the low proportion of missing data and the cross-sectional nature of the study. Extreme observations, such as an individual with severe SALT scores but a DLQI score of zero, were retained in the analysis. These cases were specifically highlighted in the Results and discussed as possible reflections of individual coping strategies or cosmetic camouflage practices. Sensitivity analyses excluding such extreme values were also conducted to verify the stability of the principal findings.

All participants were provided with detailed information regarding the purpose of the study, study procedures, the voluntary nature of participation, measures taken to ensure confidentiality, and their right to withdraw at any stage without any impact on their ongoing medical care. Data were anonymized prior to analysis and presentation to maintain participant confidentiality.

RESULTS

A total of 63 patients with a clinical diagnosis of alopecia areata were included in the analysis. The demographic and clinical profile of the study population is outlined in Table 1, while the relationship between clinical variables and DLQI scores is detailed in Table 2. The study cohort had a mean age of 29.51 ± 12.12 years, ranging from 18 to 45 years. The majority of patients were in the 21–30-year age group (39.6%), followed by those aged 31–40 years (25.3%). Females constituted a marginally higher proportion of the study population (55.6%). Over half of the participants (57.1%) were classified under the below-poverty-line socioeconomic category, and the majority were literate (88.9%). Unemployment emerged as the most frequently reported occupational status, accounting for 52.4% of participants.

Disease duration at presentation demonstrated considerable variability, with just over half of the patients (51%) presenting within six months of onset, while 27% reported a disease duration of more than 24 months. Alopecia areata with onset during childhood was observed in 25% of participants, and a history of relapse was documented in 19%. Associated comorbidities comprised hypothyroidism in 12.7% of patients and atopic disorders in 9.5%, while a family history of atopy was reported by 16% of the cohort.

Table 1: Demographic and clinical characteristics of patients with alopecia areata (n=63)

Characteristic	n (%)	Mean±SD
Age (years)		29.51±12.12
18-20	15 (23.8)	
21-30	25 (39.6)	
31-40	16 (25.3)	
41-45	7 (11.1)	
Sex		
Female	35 (55.6)	
Male	28 (44.4)	
Educational status		
Literate	56 (88.9)	
Illiterate	7 (11.1)	
Occupation		
Professional	6 (9.5)	
Skilled	5 (7.9)	
Semi-skilled	10 (15.9)	
Unskilled	9 (14.3)	
Unemployed	33 (52.4)	
Socioeconomic status		
Above poverty line	27 (42.9)	
Below poverty line	36 (57.1)	
Marital status		
Married	34 (54.0)	
Unmarried	29 (46.0)	
Duration of disease (months)		
0-6	32 (51.0)	
7-12	7 (11.0)	
13-18	1 (1.5)	
19-24	6 (9.5)	
>24	17 (27.0)	
Childhood onset		
Yes	16 (25.0)	
No	47 (75.0)	
Associated illness		
Atopy	6 (9.5)	
Hypothyroid	8 (12.7)	
None	49 (77.8)	
Family history of atopy		
Present	10 (16.0)	
Absent	53 (84.0)	

The patchy variant of alopecia areata was the most common presentation, observed in 88.9% of patients, while alopecia totalis and alopecia universalis together accounted for the remaining 11.1% of cases. The most frequent initial sites of involvement were the right parietal region of the scalp (30%) followed by the left parietal region (19%). Involvement of the upper face, including the eyebrows and/or eyelashes, was observed in 6.3% of patients. Beard involvement and body hair loss were each documented in 12.7% of cases. Nail abnormalities were noted in 19% of patients, with pitting being the most commonly observed change.

Table 2: Relationship between clinical features, disease severity, and quality of life in patients with alopecia areata

Clinical Feature	n (%)	DLQI Score (Mean)	p-value
Age group (years)			0.403
18-20	15 (23.8)	3.25	
21-30	25 (39.6)	2.94	
31-40	16 (25.3)	2.36	
41-45	7 (11.1)	2.91	
Gender			0.134
Female	35 (55.6)	3.24	
Male	28 (44.4)	2.39	
Pattern of AA			
Patchy	56 (88.9)	2.24	
Alopecia universalis	6 (9.5)	7.67	
Alopecia totalis	1 (1.6)	8.00	
Disease severity (SALT score)			0.002*
Limited (1-20)	53 (84.1)	2.02	
Moderate (21-49)	3 (4.8)	7.33	
Severe (50-94)	1 (1.6)	0.00†	
Very severe (95-100)	6 (9.5)	7.34	
Body hair involvement			0.017
B0 (None)	55 (87.3)	2.41	
B1 (Some)	3 (4.8)	5.33	
B2 (Total)	5 (7.9)	6.40	
Nail involvement			0.843
N0 (None)	51 (81.0)	2.80	
N1 (Some)	12 (19.0)	3.08	
Site of involvement			
Upper face	4 (6.3)	8.00	
Beard	8 (12.7)	2.83	
Associated illness			0.036
None	49 (77.8)	2.42	
Atopy	6 (9.5)	6.67	
Hypothyroidism	8 (12.7)	4.43	

Note: *Statistical significance (p=0.002) reflects the comparison between limited disease (SALT ≤50) and extensive disease (SALT>50). † The single patient in the "Severe" category reported a DLQI of 0, representing a specific outlier likely due to disease acceptance or cosmetic camouflage, contrasting with the high impairment observed in the "Very severe" group.

Based on SALT scoring, most patients were categorized as having limited disease (84.1%), while moderate, severe, and very severe disease accounted for 4.8%, 1.6%, and 9.5% of cases, respectively. For the purpose of analysis, participants were further dichotomized into limited disease (SALT ≤50) and extensive disease (SALT >50). Patients with extensive disease involvement exhibited significantly higher DLQI scores compared with those with limited disease (6.10 vs. 2.02; p = 0.002).

The overall mean DLQI score for the study population was 2.86 ± 4.08, with values ranging from 0 to 14 and a median score of 1, indicating predominantly mild quality-of-life impairment. More than half of the participants (54%) reported no impairment in quality of life, while 27% experienced a small effect. Moderate and large quality-of-life impairments were each reported by 9.5% of patients, and none reported a very large effect. Domain-specific analysis showed that work or school activities were affected in 25% of patients, whereas difficulties related to interpersonal relationships were reported by 61% of the cohort.

Analysis of determinants of quality-of-life impairment revealed notable interactions between age, sex, and disease-related variables. While overall DLQI scores did not show a statistically significant difference when age or sex was considered independently, subgroup analysis demonstrated distinct patterns. Females younger than 30 years demonstrated longer disease duration and higher DLQI scores, whereas among patients older than 30 years, greater impairment was observed in males. In addition, the presence of comorbid conditions was associated with increased burden, with patients having atopy showing a higher mean DLQI score (6.67) and those with hypothyroidism also demonstrating elevated scores (4.43), compared to individuals without these comorbidities (mean DLQI 2.42).

The anatomical distribution of hair loss emerged as a significant determinant of quality-of-life impairment. Upper-face involvement was associated with the highest DLQI scores, with a mean value of 8.0, indicating substantial psychosocial impact. In contrast, patients with beard involvement reported comparatively lower impairment (mean DLQI 2.83). Increasing body hair involvement was associated with a stepwise rise in DLQI scores across B0, B1, and B2 categories, demonstrating a statistically significant trend (p = 0.017). Nail involvement did not show a significant association with quality-of-life scores. A single patient with severe disease based on SALT (50–94) but a DLQI score of zero was identified as an outlier and retained in the analysis as a possible reflection of individual coping strategies.

DISCUSSION

The present study provides a comprehensive evaluation of quality-of-life impairment among patients with alopecia areata from South India, incorporating demographic, clinical, and psychosocial factors that contribute to variability in individual experiences. The mean DLQI score of 2.86 observed in this cohort reflects an overall mild level of impairment and is comparable to results reported in studies from China and Tunisia [13-15], although higher scores have been described in several international studies and meta-analyses [12], this

variability highlights the influence of sociocultural factors, including perceptions of appearance, social support systems, coping mechanisms, and access to healthcare, in shaping patient-reported outcomes. Notably, despite the low average DLQI score, nearly one-fifth of participants experienced moderate-to-large quality-of-life impairment, a pattern consistent with reports from European and Middle Eastern populations that highlight disproportionate psychosocial burden within specific subgroups [16,17]. These findings emphasize that reliance on mean scores alone may mask clinically meaningful distress and that objective disease severity does not invariably correspond to the extent of quality-of-life impact.

A key finding of this study was the distinct pattern of quality-of-life impairment observed across different age and sex groups. Female patients younger than 30 years exhibited higher DLQI scores, potentially reflecting sociocultural contexts in which hair is closely linked to feminine identity, marital expectations, and social visibility., as documented in psychodermatology studies from Asian populations [18-20]. In contrast, among patients older than 30 years, males reported greater quality-of-life impairment, which may be related to occupational demands, expectations regarding professional appearance, and fewer options for concealing scalp involvement [21]. These age- and sex-specific differences highlight the importance of adopting tailored counseling strategies rather than applying a uniform management approach across diverse demographic groups.

Evaluation of the relationship between disease severity and quality of life revealed a graded association, with patients exhibiting extensive involvement (SALT > 50) experiencing significantly greater impairment. Although earlier studies reported only a weak link between clinical severity and quality-of-life measures, more recent literature, including systematic reviews, has identified a clearer and more consistent association between SALT scores and DLQI at higher levels of disease severity [12,16]. The identification of an individual with severe SALT scores but no reported quality-of-life impairment further emphasizes that psychosocial burden is not determined solely by disease extent. Such variability may reflect personal coping mechanisms, including acceptance of the condition, use of concealment strategies, and reliance on philosophical or religious belief systems, which have been described in qualitative research [22].

Involvement of cosmetically sensitive areas emerged as a major determinant of quality-of-life impairment. Hair loss affecting the upper face, particularly the eyebrows and eyelashes, was associated with substantially higher DLQI scores compared with beard involvement, underscoring the heightened psychosocial importance of central facial features. Loss of eyebrows and eyelashes is particularly difficult to conceal and can substantially alter facial expression, self-perception, and social interaction, findings that are consistent with previous studies demonstrating disproportionate emotional distress when these sites are affected [23,24]. These observations highlight the importance of early and targeted management of facial alopecia areata-such as intralesional therapies or prostaglandin analogues—not only to address cosmetic concerns but also to achieve meaningful improvements in patient-reported quality of life.

The presence of comorbid atopic conditions and hypothyroidism was associated with greater quality-of-life impairment, consistent with findings from Indian and international cohorts., Tunisian studies, and registry-based analyses from the United States [15,25]. Atopy has been linked to more persistent or severe forms of alopecia areata, whereas hypothyroidism may indirectly amplify psychosocial distress through symptoms such as fatigue, mood disturbances, and heightened cosmetic concern. Additionally, body hair involvement emerged as a meaningful yet often overlooked contributor to quality-of-life reduction, with a stepwise increase in DLQI scores corresponding to greater body hair loss. The stepwise increase in DLQI scores observed from B0 to B1 and B2 categories highlights the broader consequences of body hair loss on self-esteem, perceived normalcy, and functional aspects such as photoprotection, paralleling observations reported in international literature [26].

The strengths of this study include its comprehensive assessment of a wide range of demographic and clinical variables, site-specific analysis of disease involvement, and the provision of region-specific data from South India. However, certain limitations warrant consideration, including the cross-sectional design, relatively small sample size, reliance on self-reported information, and the presence of isolated outlier observations. These factors necessitate cautious interpretation of the findings and underscore the importance of future longitudinal or mixed-methods research to better characterize changes in quality of life over time, explore coping strategies, and understand

psychosocial trajectories in patients with alopecia areata.

Taken together, these findings indicate that quality-of-life impairment in alopecia areata extends beyond clinical severity alone and reflects a multifactorial interplay involving demographic characteristics, disease pattern and extent, associated comorbidities, sociocultural influences, and individual coping capacity. Routine incorporation of quality-of-life assessment into clinical practice—especially for younger female patients, individuals with comorbid atopy or hypothyroidism, and those with facial or extensive disease—may facilitate early recognition of patients at heightened risk of psychosocial distress. Adoption of individualized counselling strategies, comprehensive management approaches, and focused treatment of cosmetically sensitive areas has the potential to significantly improve patient-centred outcomes. Future studies employing longitudinal methodologies and culturally contextualized quality-of-life instruments are warranted to further elucidate the evolving burden of alopecia areata across diverse populations.

CONCLUSION

This study highlights that quality-of-life impairment in alopecia areata is driven by a multifaceted interaction of demographic characteristics, clinical features, and psychosocial factors, rather than by disease severity alone. While the overall DLQI scores in this South Indian cohort suggest a modest average impact, a meaningful proportion of patients—particularly younger women, those with associated atopy or hypothyroidism, and individuals with facial or extensive disease—experience significant psychological and social distress.

These findings underscore the importance of integrating routine quality-of-life evaluation into standard clinical care for alopecia areata, with focused attention on patients at higher risk of adverse psychosocial outcomes. Early, targeted management of cosmetically sensitive areas such as the eyebrows and eyelashes, timely identification and treatment of associated comorbidities, and individualized psychosocial support may substantially improve patient well-being. Given the strong links between alopecia areata, self-perception, and culturally mediated concepts of appearance, effective management must address both physical manifestations and emotional consequences to ensure truly patient-centred care.

Future investigations should adopt longitudinal and mixed methods approaches to more accurately capture the evolving relationship between disease activity, coping strategies, and psychosocial health. The development of region-specific normative data and culturally tailored quality-of-life instruments may further enhance understanding of the burden of alopecia areata across diverse populations.

Statement of Human and Animal Rights

All the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the 2008 revision of the Declaration of Helsinki of 1975.

Statement of Informed Consent

Informed consent for participation in this study was obtained from all patients.

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